

WHAT IS CLAIMED IS:

1. A method for adaptively controlling a hybrid electric vehicle including an energy generation system, an energy storage system receiving energy at least from the energy generation system, and at least one electric motor receiving energy from the energy storage system with the energy generation system selectively operated in various operation modes, comprising:
  - operating the energy generation system in a first mode in which the energy generation system is off and the motor propels the vehicle from power stored in the energy storage system;
  - operating the energy generation system in a second mode in which the energy generation system is operating without restriction as to limiting vehicle discharges; and
  - operating the energy generation system in a third mode in which the operation of the energy generation system is at least partially restricted to limit vehicle discharges.
2. The method of claim 1, further comprising:
  - operating the energy generation system in the first mode when the vehicle is driven in a zone where substantially zero emissions are allowed.
3. The method of claim 1, further comprising:
  - operating the energy generation system in the second mode when the vehicle is driven in a zone with substantially no emission restrictions.
4. The method of claim 1, further comprising:
  - operating the energy generation system in a third mode when the vehicle is driven in a zone with emission restrictions.
5. The method of claim 1, further comprising:
  - monitoring an operator input to determine the operating mode used.
6. The method of claim 1, further comprising:
  - monitoring an external signal to determine the operating mode used.
7. The method of claim 1, further comprising:
  - monitoring component states to determine if a fault state is present, and determining the operating mode used based upon the status.

8. The method of claim 1, further comprising:  
determining if the energy generation system has exceeded a  
predetermined energy level while operating in the second and third modes; and  
lowering an energy level of the energy generation system if the  
predetermined energy level has been exceeded.

9. A hybrid electric vehicle, comprising:  
an energy generation system;  
an energy storage system receiving energy at least from the generation  
system;

at least one electric motor receiving energy from the energy storage  
system; and

a controller that selectively operates the energy generation system in  
various operation modes, including:

a first mode in which the energy generation system is off and  
the motor propels the vehicle from power stored in the energy storage system;

a second mode in which the energy generation system is  
operating without restriction as to limiting vehicle discharges; and

a third mode in which the operation of the energy generation  
system is at least partially restricted to limit vehicle discharges.

10. The vehicle of claim 9, wherein the controller:  
operates the vehicle in the first mode when the vehicle is driven in a  
zone where substantially zero emissions are allowed.

11. The vehicle of claim 9, wherein the controller:  
operates the vehicle in the second mode when the vehicle is driven in a  
zone with substantially no emission restrictions.

12. The vehicle of claim 9, wherein the controller:  
operates the vehicle in a third mode when the vehicle is driven in a  
zone with emission restrictions.

13. The vehicle of claim 9, wherein the controller:  
monitors an operator input to determine the operating mode used.

14. The vehicle of claim 9, wherein the controller:

monitors an external signal to determine the operating mode used.

15. The vehicle of claim 9, wherein the controller:

monitors component states to determine if a fault state is present, and  
determining the operating mode used based upon the status.

5 16. The vehicle of claim 9, wherein the controller:

determines if the energy generation system has exceeded a  
predetermined energy level while operating in the second and third modes; and  
lowers an energy level of the energy generation system if the  
predetermined energy level has been exceeded.

10 17. A method for adaptively controlling a hybrid electric vehicle including  
an emission creating energy generation system, an energy storage system receiving  
energy at least from the energy generation system, and at least one electric motor  
propelling the vehicle through a zone of reduced emissions, comprising:

15 determining the zone of reduced emissions;  
turning off the energy generation system before entering the zone;  
maintaining the energy generation system in an off mode while the  
vehicle is propelled in the zone by the motor; and  
turning on the energy generation system after the vehicle leaves the  
zone.

20 18. The method of claim 17, wherein the zone is a substantially zero  
emission zone.

19. The method of claim 17, wherein emission gases are prevented from  
entering the zone.

25 20. The method of claim 17, further comprising:  
determining the electrical charge of the energy storage system before  
entering the zone; and  
charging the energy storage system to a predetermined electrical level  
before entering the zone if the electrical charge is below the predetermined electrical  
level.

30 21. The method of claim 20, further comprising:

raising the rate for charging the energy storage system to reach the predetermined electrical level.

22. The method of claim 21, further comprising:  
performing a global power shed by reducing ancillary systems of the  
5 vehicle to increase the rate for charging.

23. The method of claim 1, further comprising:  
lowering the operating temperature of the energy generation system to  
a predetermined temperature before the vehicle enters the zone.

24. The method of claim 17, wherein the vehicle responds to sensors to  
10 automatically change an operation mode of the vehicle.

25. The method of claim 17, wherein the vehicle responds to manual  
switches to manually change an operation mode of the vehicle.

26. A hybrid electric vehicle, comprising:  
an emission creating energy generation system;  
15 an energy storage system that receives energy at least from the energy  
generation system;

a least one electric motor receiving power from the energy storage  
system, the motor propelling the vehicle; and

a controller that:  
20 determines a zone of reduced emissions;  
turns off the energy generation system before entering the zone;  
maintains the energy generation system in an off mode while  
the vehicle is propelled in the zone by the motor; and  
turns on the energy generation system after the vehicle leaves  
25 the zone.

27. The vehicle of claim 26, wherein the zone is a substantially zero  
emission zone.

28. The vehicle of claim 26, wherein emission gases are prevented from  
entering the zone.

30 29. The vehicle of claim 26, wherein the controller:

determines a state of charge of the energy storage system before entering the zone; and

activates the energy generation system to charge the energy storage system to a predetermined level before entering the zone if the state of charge is below the predetermined level.

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30. The vehicle of claim 29, wherein the controller:  
increases the rate for charging to reach the predetermined level before entering the zone of reduced emissions.

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31. The vehicle of claim 30, wherein the controller:  
performs a global power shed by reducing ancillary systems of the vehicle to increase the rate for charging.

32. The vehicle of claim 26, wherein the controller responds to sensors to automatically change an operation mode of the vehicle.

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33. The vehicle of claim 26, wherein the vehicle responds to manual switches to manually change an operation mode of the vehicle.

34. A hybrid electric vehicle, comprising:  
an emissions creating energy generation system connected to a generator;

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an electrical energy storage system receiving current at least from the generator;

a least one electric motor receiving current from the electrical energy storage system, the motor propelling the vehicle; and

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a controller that controls the vehicle according to the following modes:

a normal mode where the energy generation system and generator operate to produce power higher than a power consumption of the motor;

a first transition mode, after the controller determines a zone of reduced emissions, for determining an electrical charge of the energy storage system before entering the zone, activating the generator to charge the energy storage system to a predetermined electrical level before entering the zone if the electrical charge is below the predetermined level, and turning off the energy generation system and the generator before entering the zone; and

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a reduced emission mode after the first transition mode for maintaining the energy generation system and the generator in the off mode while the vehicle is propelled in the zone by the motor.